Annual Project Summary

Western Great Basin Seismic Network Operations

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SUMMARY

The Nevada Seismological Laboratory monitored seismicity in western Nevada and eastern California from October 1, 2001 to September 30, 2002. Over 7900 earthquakes total were located, thirty-two greater than Ml 3.0. The largest was Ml 4.4, in southern Nevada. Earthworm export software was used to replace telephone and microwave hardware and improve network integration with the Northern California Seismic Network. Western Great Basin waveform archives are for the first time are available by research account at UNR. Fourteen new urban strong-motion accelerographs were installed and a ShakeMap capability was developed.

PROJECT TASKS

Specific tasks for the reporting period included:

1. Seismic Network Operations
2. Real-time Integration of Networks
3. Access to and Distribution of Earthquake Information
4. ANSS Strong Motion Installation

SEISMIC NETWORK OPERATIONS

Over 7900 earthquakes were located in the Western Great Basin Network region during FY 2002. This total reflects the continuing higher number of events per year that resulted when the analog system was combined with generally sparse three-component Reftek recorders. That combination doubled the number of located events per year, and was not anticipated at the initiation of the Cooperative Agreement in December 2000. Seismicity in Figure 1 is consistent

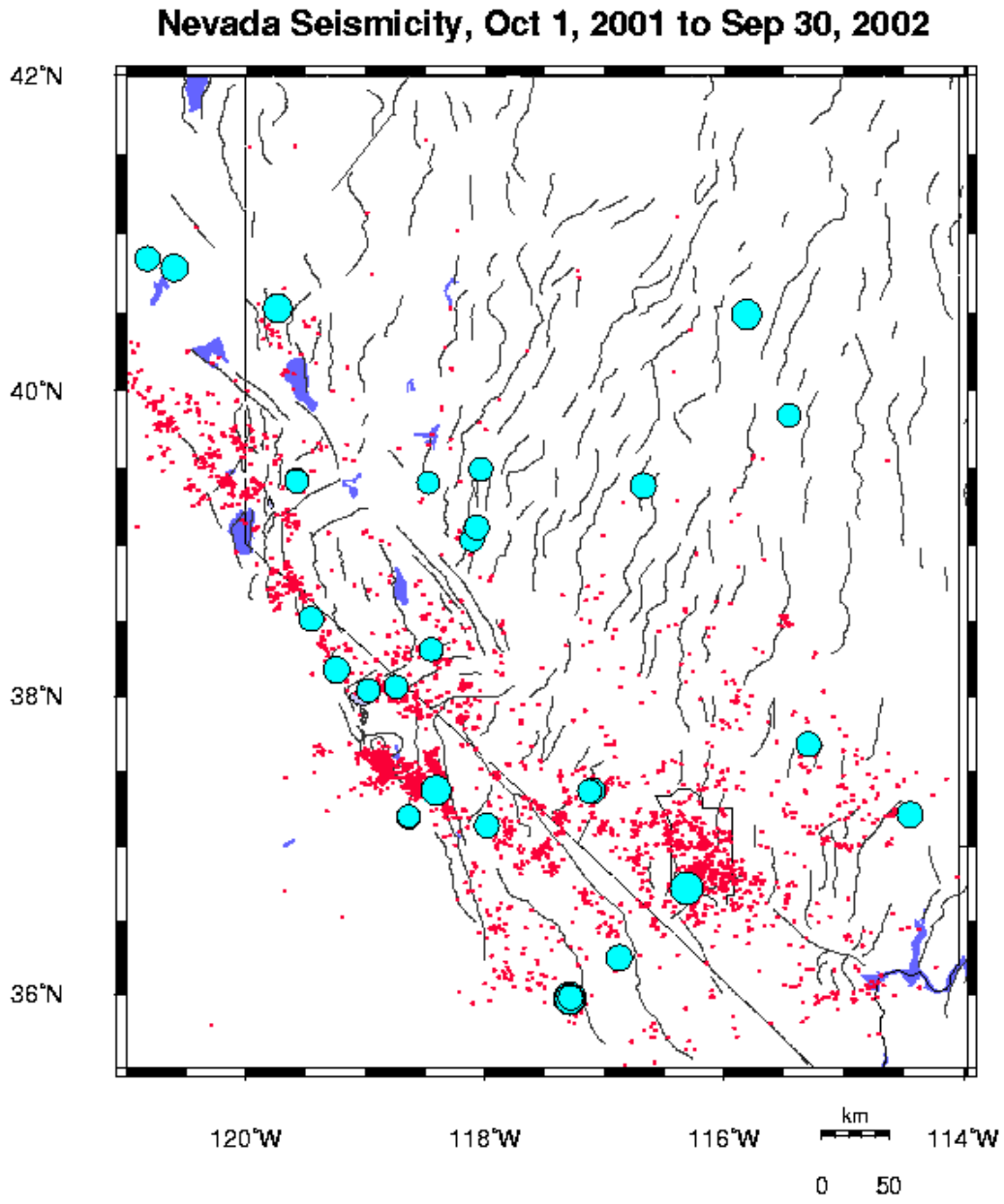

Figure 1. Earthquakes located in FY 2002 by the Western Great Basin Seismic Network. Gray circles are earthquakes with Ml>=3.0, and scaled by magnitude. The largest is Ml 4.4.

with previous years and low-rate extensional tectonics that predict widespread, low-level activity. Ml 3 and larger events are more widely dispersed than in previous years, for no obvious reason. The only earthquake of particular note during the year was the Ml 4.4 event that occurred on June 14, 2002 in the southwest corner of the Nevada Test Site. This earthquake was not distinguished for its size so much as its location, approximately 18 km from Yucca Mountain, a site selected by the Department of Energy for a high-level nuclear storage facility.

The network in that area is funded and staffed as a separate but cooperating monitoring project within Nevada.

REAL-TIME INTEGRATION OF NETWORKS

Significant progress has been made in real-time integration of networks. For several years UNR has been remodulating seismic stations around the Long Valley area in eastern California and sending them by telephone and microwave to the Northern California Seismic Network (NCSN). This method incurred telephone line charges and relied on access to microwave frequencies in California which have been reallocated. Starting this summer a parallel data transfer link was established using an Earthworm export from UNR. After a period of overlapping operation, the NCSN now relies completely on the Earthworm export for these stations. Since the Earthworm software supports other data sources, data exchange with NCSN was expanded to include higher quality three component Reftek data from several WGB stations, thus improving NCSN capabilities for location and event analysis. UNR also now imports some channels from the NCSN to improve earthquake locations in the eastern Sierras. UNR also supports data exchanges with the Southern California Seismic Network for monitoring eastern California, the University of Utah for western Utah and eastern Nevada, the Anza array, U. C. Berkeley, the IRIS Data Management Center, and the USGS National Seismic Network.

In the reporting period UNR and the California Integrated Seismic Network (CISN) worked out reporting boundaries for real-time notification of significant earthquakes. The geographic and historical boundaries of the eastern Sierra Nevada were inconsistent with the CISN need to speak with one voice to the California Office of Emergency Services (OES) on significant earthquakes. Real time reporting to California Office of Emergency Services will now come only from the CISN. Catalog and final reporting responsibilities within the network will remain those established for CNSS.

ACCESS TO AND DISTRIBUTION OF EARTHQUAKE INFORMATION

The Nevada Seismological Laboratory made significant progress in access and distribution of seismic data in the reporting period. As noted above NSL has made data available to a number of cooperating seismic networks. In addition data are provided in real time to other non-network entities, including an externally funded emerging educational network initiative by another NSL seismologist. That program sponsors placement of software, digitizers and inexpensive sensors in high schools for the dual purposes of earth science education for the schools and improved urban station coverage for network applications. WGB grant funds are used to maintain exports of NSL station data for this and other public applications and displays.

USGS support for WGB operations has helped maintain catalog and web page reporting as a mainstay of our public interface. The web site hosts pages describing NSL efforts under the ANSS urban strong-motion project and selected data from installed strong motion instruments.

The WGBSN cooperation with another initiative within the NSL has led to a major improvement in the availability of legacy recordings by the WGBSN. Archives of waveforms were held in 9-track tapes for the period from 1981 to 1993. Local ability to play these tapes back has been lacking for several years, rendering this data unavailable. Support by others provided for the

remastering of these tapes to a locally readable format. Organization of waveform and header data is ongoing, but already most of the CUSP and PING format data recorded on 9-track tapes is available at least on a research account basis.

ANSS STRONG MOTION INSTALLATION

Supplemental funding by the USGS for the ANSS urban strong motion initiative supported the installation of 15 new strong-motion instruments. Fourteen were actually installed, six around Reno, three in the Carson Valley, and five in the Las Vegas Valley. The fifteenth unit was dead on arrival, either shaken apart in shipment or perhaps mis-assembled. It will be installed when returned from Reftek. As in previous years we have emphasized radio or IP telemetry to save on long-term operating costs. Several instruments are presently recording only in triggered mode. However, two pre-ANSS accelerographs in the Reno area were added to radio telemetry for local recording.

The other point of significant progress in the project year was the addition of the capability to make ShakeMaps directly from the Antelope acquisition software system. This effort is not quite ready for automatic use because of other operational issues within the data processing stream, but it should be fully operational by January 2003.

DATA AVAILABILITY

At present seismic data from the Western Great Basin is available primarily by research account at UNR. Strong-motion event separates are available on a similar basis. A database of archived waveforms is under development, and should provide web access by the middle of calendar 2003. Event separates are available in SAC format and in a CSS database. Inquiries may be addressed to Glenn Biasi, glenn@seismo.unr.edu, (775) 784-4576.

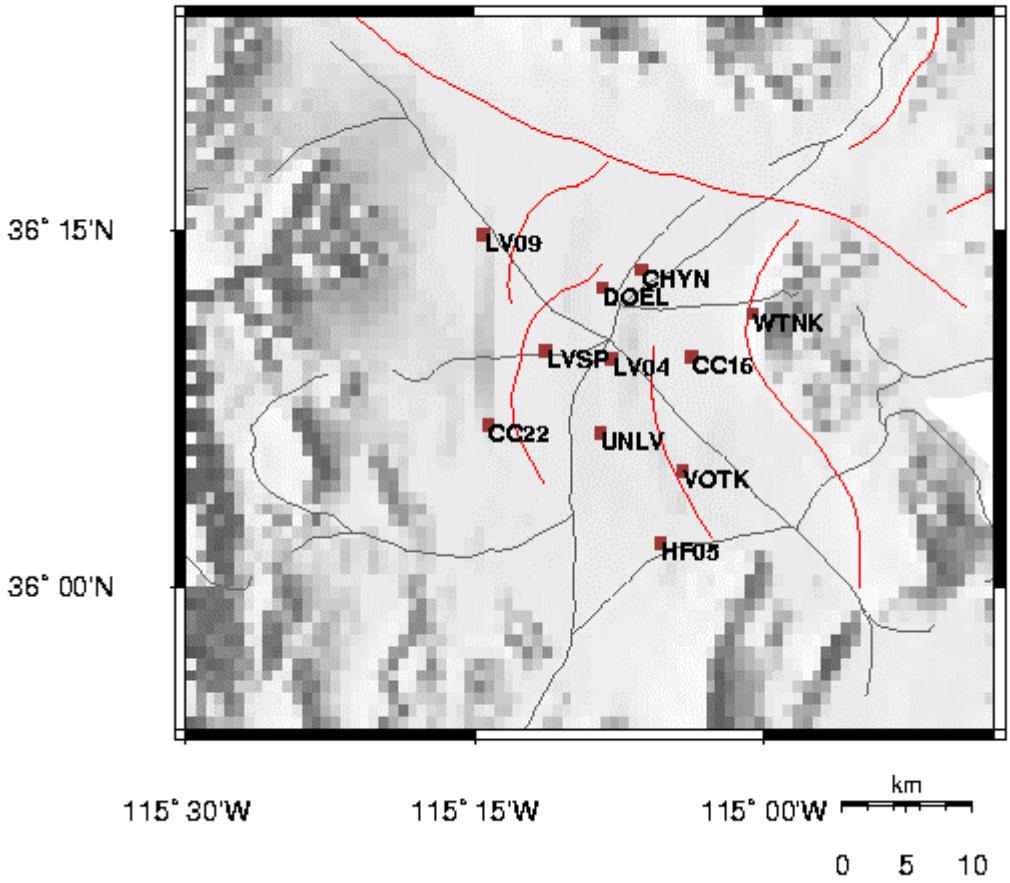

Figure 2. Las Vegas Valley strong-motion instrumentation sites. The ANSS program has significantly improved coverage of Nevada's most populous urban region. In FY 2002 stations WTNK, CC16, CC22, VOTK, and HF05 were added. WTNK is important as a rock reference site to which other site ground motions can be compared. Only two stations, LV09 and LV04, were in place at the start of the current Cooperative Agreement.